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DECISIONMAKING IN THE FOOD  
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James Nielson and John M. Brazzel, —

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# Joint Planning and Evaluation Staff Paper

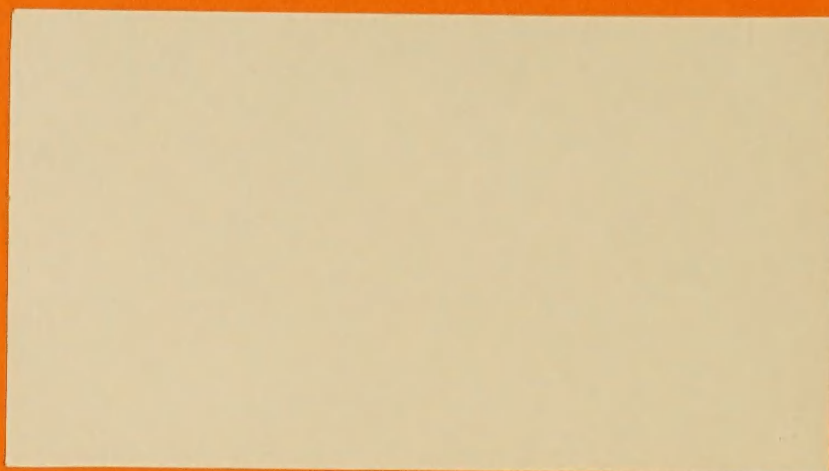
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The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Science and Education Administration or the United States Department of Agriculture.

## PREFACE

This paper was prepared at the request of Dr. Mark T. Buchanan, Director-at-Large of the Western Association of Agricultural Experiment Station Directors. It was presented as one of five papers in a program on "Federal Funding Philosophies, Policies, and Procedures: Impact on Research in the Food and Agricultural Sciences" at the annual meeting of the American Association for the Advancement of Science (AAAS), San Francisco, California, January 7, 1980.

We have received very helpful comments from Dr. Buchanan and the other participants in the AAAS program, from our colleagues in Joint Planning and Evaluation, and from a number of other people. B.R. Eddleman and Vernon W. Ruttan provided especially thought-provoking comments and suggestions that have been very useful in revising the paper. The ideas expressed in the paper are those of the authors and do not necessarily represent the official position of the Science and Education Administration and the U.S. Department of Agriculture.

EVALUATION AS AN AID TO DECISIONMAKING IN THE  
FOOD AND AGRICULTURAL SCIENCES

EXECUTIVE SUMMARY

A new decisionmaking process is beginning to emerge in food and agricultural science and education. The evaluation of economic, social, and environmental impacts is an integral part of that process. A series of changes are taking place that represent a significant redefinition of the decisionmaking process and that suggests future changes in evaluation as a part of that process. These changes include new institutions that have resulted from Title XIV of the Food and Agriculture Act of 1977--the Committee on Food and Renewable Resources, the Joint Council on Food and Agricultural Sciences, and the National Agricultural Research and Extension Users Advisory Board.

Longstanding understandings among the Federal and State partners in the funding and provision of agricultural research are being questioned and renegotiated. The composition of that partnership is expanding to include a broader set of decisionmakers--those who are stakeholders in the outcomes of agricultural science and education. They include providers of funds, providers and users of agricultural science and education services, and people and institutions impacted by the food and agricultural sciences.

The emerging framework for decisionmaking will mean that decisions about agricultural science must be informed both about the quality of agricultural research, extension, and teaching programs, and about their economic, social, and environmental impacts.



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# EVALUATION AS AN AID TO DECISIONMAKING IN THE FOOD AND AGRICULTURAL SCIENCES

James Nielson and John M. Brazzel\*

This paper will first, describe recent changes in the decisionmaking process in the food and agricultural sciences and key relationships among participants in that process; then, examine the current status of the evaluation of food and agricultural research; and finally, suggest future directions in evaluation as a part of the decisionmaking process.

## The Decisionmaking Process

### Recent Changes--Title XIV, Food and Agriculture Act of 1977

The institutional framework within which decisions are made about food and agricultural research is changing as a result of innovations called for in Title XIV of the Food and Agriculture Act of 1977. These innovations include:

#### 1. Committee on Food and Renewable Resources

Congress directed the establishment of the Committee on Food on Renewable Resources of the Federal Coordinating Council for Science, Engineering, and Technology. The Committee's function is to bring about better planning and coordination of research in food, renewable resources, and nutrition among agencies of the Federal government. It includes representatives from 12 Federal agencies.

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## 2. Joint Council on Food and Agricultural Sciences

Congress believed that there was unnecessary duplication in agricultural research so it directed the establishment of the Joint Council on Food and Agricultural Sciences to foster improved planning and coordination. This occurred in spite of testimony from the U.S. Department of Agriculture (USDA) and university representatives that a new congressionally-mandated body was not needed.

Congress directed that the Joint Council foster regional and national planning and coordination of agricultural extension and teaching activities as well as research, and that non-land-grant universities and representatives of private industry participate along with the more traditional land-grant and USDA partners. The Joint Council also was given a charge to "analyze and evaluate the economic, environmental, and social impacts of agricultural research, extension, and teaching programs...and determine high priority research areas..."

Congress hoped that unified plans with delineation of responsibilities developed and agreed upon through efforts of the Joint Council would help it in dealing with what appeared to be overlapping and competing requests for Federal funds from various components of the agricultural science and education system.

The Council is alive, well and active. Whether the hopes of Congress will be realized through it remains to be seen, but it will likely lead to some improvement in planning, coordination and evaluation.

## 3. National Agricultural Research and Extension Users Advisory Board

Both the legislative and executive branches of Federal government have been motivated to obtain greater citizen participation in public decisionmaking on policies and programs in general, and on agricultural



science and education programs in particular. (State and local governments, of course, have similar objectives.) One of the mechanisms to obtain citizen input is the National Agricultural Research and Extension Users Advisory Board. The Board prepares independent advisory opinions about program priorities, Federal budgets, division of responsibilities, and effectiveness of agricultural research and extension programs for use by the Congress, the President, the Secretary of Agriculture and by all of the partners in the system. It is composed of 21 members who represent users of and those impacted by agricultural research and extension activities. Local, State and Federal agencies who are users of research and extension services are not represented on the Board.

For 21 citizens with great diversity of interests and philosophies--all of whom have full-time jobs--to arrive at a consensus on national research and extension priorities is a major assignment. While they still have quite a way to go, their October 1979 report amazed almost everyone in its relevance and degree of consensus.

The creation of the Committee on Food and Renewable Resources, Joint Council, and Users Advisory Board provides for the inclusion of a new, much broader set of participants in the decisionmaking process of the food and agricultural sciences. These actors--or "stakeholders" in the outcomes of research, extension, and teaching in the food and agricultural sciences--now include Federal, State and private providers of funds; Federal, State, university, and private providers of agricultural science services; users of agricultural science services; and people and institutions impacted by the food and agriculture sciences.



Title XIV goes beyond the definition of a more inclusive participation in the decisionmaking process. It also calls for the integration of extension and teaching with research in the decisionmaking process, and calls for the consideration of economic, social, and environmental impacts of agricultural science programs in decisionmaking.

#### Contracts Among Participants in the Decisionmaking Process

The institutional framework for decisionmaking in the food and agricultural sciences encompasses a series of implicit and explicit understandings, agreements or contracts among the participants. These understandings include the concepts of accountability, the Federal-State partnership, and what Richard Atkinson (2) and Philip Handler (5) have termed the social contract between science and society.

The increased emphasis on accountability for the use of public funds is one of the most significant developments of the 1970's. It involves either an implicit or explicit contract between providers of public funds for food and agriculture science (Federal and State) and recipients of those funds who produce agricultural research, extension, and teaching services. Funds are provided through Federal and State budgeting processes, which now require more detailed documentation of the needs for and uses of funds and anticipated impacts of programs.

The Federal-State partnership in the provision of agricultural research, extension, and teaching involves a long-term, cooperative relationship between the U.S. Department of Agriculture and the State land-grant universities that began in the late 1800's and early 1900's with the Morrill, Hatch, and Smith-Lever Acts. The partnership grew out of the conviction that the joint and cooperative provision of agriculture, research, extension, and teaching by the Federal and State governments could best provide for the needs of farmers, consumers, and society.

An implicit understanding or social contract has developed over time between the science community and society as a part of the increased public

involvement in science. This contract acknowledges that the public support of science, along with a strong degree of independence of science institutions, are in the social interest. The elements of the social contract between science and society and its operation are described by Higgins (6, p.5):

If science is to be a personalized cultural pursuit then its level of funding will soon drop to the levels of other cultural activities. If, on the other hand, science is to be supported as an instrument of social change and funded accordingly, then it must respond to societal need, and society will insist on the deliberate direction of scientific activity towards areas of greatest social need or potential.

#### Contract Challenges and Renegotiations

These understandings are now being challenged by a general concern and doubt among the participants in the decisionmaking process in the food and agricultural sciences. These doubts arise out of:

1. Dwindling rates of increases in Federal budgets for agricultural research and extension, especially as related both to apparent needs and to the rate of inflation.
2. Concern among some State partners as to whether the Federal government is as committed as it once was to the Federal-State partnership. These doubts appear to stem from reaction to reorganization of the science and education agencies of the USDA; representatives of the Federal government, especially the Office of Management and Budget (OMB), making unilateral decisions on the portion of the research agenda that will be left to the States; the recent interest in competitive grants, as opposed to formula-funding, as a mechanism for providing Federal funds for agricultural science and education; and actions by both the Legislative and Executive Branches of the Federal government to include nontraditional participants in the decisionmaking process.

3. Increased restrictions on the use of public funds provided for science.
4. Changing social goals in the direction of social equity, conservation of natural resources, environmental quality, and quality of life and away from production, efficiency, and income.
5. Recognition of what are now perceived as undesirable social and environmental impacts of some technological advances in agriculture.
6. A growing public skepticism about the responsiveness of the general science community, including the food and agricultural sciences, to social needs.
7. The potentially inherent conflict between views of science as value-neutral activities, autonomous and independent of the social system, and the concepts of public and social accountability.

These concerns have led to a process of questioning and renegotiating the existing understandings and contracts among participants in the decisionmaking process in the food and agricultural sciences, as well as an expansion in the scope of those included as participants. The formation of the Committee on Food and Renewable Resources, Joint Council, and Users Advisory Board are examples of that response.

Other institutional mechanisms have appeared in recent years. They include public interest groups, such as the Agribusiness Accountability Project and Center for Science in the Public Interest; Federal and State public participation, freedom of information, and consumer affairs laws and regulations; public and privately-sponsored workshops, conferences, and dialogues about research and technology in agriculture; and an increased interest and involvement of Federal and State courts in the conduct of agricultural research.



These and additional concerns about the scarcity of public information describing the status of the food and agricultural sciences have resulted in requirements for enhanced collection of management information, external peer review of programs, and program impact measurement and evaluation.

### The Evaluation Process

The evaluation process in the food and agricultural sciences includes (1) the assessment of the technical or scientific quality of programs and (2) the measurement and evaluation of the technological, economic, social, and environmental impacts of the programs.

The first category of evaluation includes program and external peer reviews which can be categorized as process or management evaluation; this evaluation category has been described and analyzed in an excellent paper by Vernon Ruttan (9).

In this paper we are focusing on the second category of evaluation -- impact evaluation. This section includes a brief description of the major elements of an impact evaluation process and an assessment of the status of evaluation in the food and agricultural sciences. Future changes that can be anticipated in evaluation as part of the decisionmaking process are examined later.

### Characteristics of Impact Evaluation

Good impact evaluation studies\* address questions related to the outputs and inputs of science programs, such as:

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\*Criteria for judging the quality of impact evaluations are suggested in a report by the United States General Accounting Office (12, p. 2) to include relevance, significance, validity, reliability, objectivity, and timeliness. The GAO report provides a useful framework and checklist for determining whether these criteria are met by specific impact evaluation studies.

1. Were the objectives of the research program accomplished?
2. What were the technological, economic, social and environmental impacts of the program?
3. Who benefits from the programs, how, and how much?
4. Who is worse off because of the programs, how and how much?
5. What were the cost of the programs in terms of investments and other opportunities foregone?
6. Who bears the costs?
7. How do the benefits compare with the costs?

Evaluation is an important source of program information that can be useful in the decisionmaking process. Uses of impact evaluation results include program planning, coordination, establishment of priorities, redirection of program resources, budget development, and more informed and more timely involvement in the decisionmaking process by participants.

Participants or stakeholders in the decisionmaking process in the food and agricultural sciences are also stakeholders in the quality, objectivity, and results of the evaluation process. These participants include Federal, State, and private providers of funds; Federal, State, university, and private sector performers of agricultural science; users of research, extension, and teaching services; and people and institutions impacted by the food and agricultural sciences.

An important, second order but highly pragmatic use of evaluation results is the documentation of needs for food and agricultural research, extension, and teaching budgets. This is a sensitive and delicate issue for the evaluation process and must be treated very seriously. Results from high-quality, objective evaluation studies can help in establishing budget needs because the data are believable and accepted. Inappropriate uses of evaluation results or the conduct

of self-serving analyses under the guise of the evaluation process can destroy the credibility and usability of evaluation results as a part of the decision-making process.

In order for evaluation results to be most useful to participants in the decisionmaking process, they must be designed and conducted in such a manner as to have credibility both with those whose programs are being evaluated and those who may use the evaluation results. This implies close adherence to scientific method in conceptualizing and conducting the studies. It also requires the use of evaluation personnel whose main motivation is the professional quality and usefulness of the evaluation product.

#### Status of Evaluation in Food and Agricultural Science

Evaluation of the impacts of agricultural science programs within the food and agricultural science community has been conducted primarily by a few agricultural economists and rural sociologists in land-grant universities and several nonland-grant universities, and by agricultural economists in the USDA. Levels of resources committed to impact evaluations have been quite low.

For several years during the mid-1970's, each of the four regional associations of State agricultural experiment station directors sponsored research evaluation activities by one or two analysts in each region. USDA assisted these programs financially and otherwise. In the West, the regional analyst was supported by the State extension directors also, and evaluated both extension and research programs.

The Science and Education Administration (SEA) in USDA has recently formed a small, multidisciplinary Evaluation and Impact Staff (EIS) with the responsibility, in part, to conduct impact evaluations of agricultural research, extension, and teaching programs. An annual budget has not been allocated



at this time for impact evaluation studies in SEA. Funds for this purpose are limited and are negotiated on an ad hoc basis as needs for evaluation studies become apparent.

New efforts are underway to foster and encourage the development of a healthy evaluation process in the agricultural sciences. The Joint Council will encourage the evaluation of program impacts, and potentially the formation of regional networks of people concerned with the evaluation process, as a part of its efforts to foster planning and coordination at both the regional and national levels. The Users Advisory Board also will encourage program evaluation.

The State agricultural experiment stations have formed a new interregional research project on Planning, Evaluation, Analysis, and Coordination of Research (IR-6). B. R. Eddleman is Director of the project. One of the objectives of IR-6 is "to foster research to evaluate the impacts--economic, social, and environmental--of agricultural research programs."

Evaluation methodologies and findings for the agricultural sciences have been examined in a series of conferences in 1969, 1975, 1976, and 1978. The conference proceedings for the first three conferences are reported in Fishel (4), Arndt, Dalrymple, and Ruttan (1), and Back (3). A further conference in 1980 is being organized by Walter Fishel. The expanding scope and participation in evaluation activities in the agricultural sciences are indicated by a comparison of the proceedings and participants in these conferences. The conferences have involved an increasingly wider group of people within the agricultural science community and some from outside the community. The conference papers address studies concerned with technology assessment and domestic and international programs. A few studies examine both research and extension programs.

The status of evaluation methodology and results in agricultural research is reviewed in reports by Higgins (6), Norton and Davis (8), Schuh and Tollini (10), and Shumway (11). Significant accomplishments have been made in the development and application of methodologies to estimate the impacts of agricultural research on agricultural productivity and national income. Procedures have been developed for ex ante and ex post evaluation studies. Early estimates of the returns to aggregate production-oriented agricultural research have been refined. Estimates of the returns to both research and extension are now available. Disaggregated estimates for categories of commodities and for regions are also available. Methodologies for estimating the returns to agricultural research have increased in number and improved in quality.

Most evaluations of agricultural research have focused on impacts on agricultural productivity. Some of the reasons for this focus appear to be (1) most of the studies have been conducted by economists, and measurement of productivity has been central to the mainstream of economics; (2) throughout the 1950s and 1960s, productivity and efficiency were among the major goals of our society; (3) evaluation of productivity was facilitated by available data bases; and (4) evaluation of research and extension programs, not directly related to production, involve measurement and other methodological problems.

Relatively few studies are available that measure and assess broader economic, social, and environmental impacts of agricultural science programs. There are exceptions, including those in the areas of public policy analysis and in studies of the impacts of chemical pesticides and non-point pollution and water quality. Madden (7) reviews a number of studies that have examined aspects of the broader economic and social considerations in the area of agriculture mechanization. In general, however, little attention has been

given to evaluating the broader economic, social, environmental and technological impacts of food and agricultural science.

The evaluation process in food and agricultural science generally can be characterized as operating from a relatively narrow base in view of its:

1. Emphasis on production impacts, as opposed to broader economic and social impacts of programs.
2. General focus on agricultural research activities, rather than the total research, technology development, transfer, and adoption process involved in agricultural research, extension, and teaching programs.
3. General isolation of evaluation activities from the planning, resource allocation, and budgeting processes in the food and agricultural sciences.
4. Isolation from and a lack of awareness of the impact evaluation methodologies applied outside of agriculture, the development of Ph.D. programs in evaluation research at a number of universities, and the rapidly-growing evaluation-research community throughout the United States.

While there have been a number of good, objective evaluations of agricultural research and extension, overall the credibility of agricultural science evaluation is questioned by Congress, the Office of Science and Technology Policy (OSTP), OMB and some of the public impacted by the programs. Perhaps because of the low-level commitment of resources to the evaluation process in the food and agriculture sciences, its narrow focus, and its general isolation from evaluation methodologies used outside of agriculture, there is a general and pervasive skepticism about the objectivity of current evaluation efforts in the food and agricultural sciences.



Future Directions in Evaluation as  
Part of the Decisionmaking Process

Evaluation is at the center of the dialogue that is taking place about the decisionmaking process in agricultural science and education. Changes that are occurring today and that have been discussed in this paper suggest future patterns in impact evaluation that will take place as a part of the evolving changes in the overall decisionmaking process. They include:

1. Expansion of the traditional partnership in the agricultural science and education system, and increased public involvement in agricultural science decisionmaking and evaluation at national, State and local levels.
2. Increased numbers of specifically-defined evaluation studies required by Congress, the Office of the President (OMB and OSTP), State governments, the Joint Council and the Users Advisory Board.
3. Expanded and earmarked Federal and State Budgets used for evaluation research at national and State levels.
4. Development of an integrated, trained evaluation-research community and network among the local, State and Federal partners in the system.
5. Decisionmaking about the evaluation of agricultural research at national, regional, and State levels in the context of the overall agricultural research, extension, and teaching process involved in the food and agricultural sciences.

Concluding Comments

A new decisionmaking process is beginning to emerge in the food and agricultural sciences. The evaluation of economic, social, and environmental impacts is an integral part of that process. We have examined a series of

changes that are taking place that represent a significant redefinition of the decisionmaking process and have suggested future directions in evaluation as part of that process.

Longstanding implicit and explicit contracts among the Federal and State partners in the funding and provision of agricultural research are being questioned and renegotiated. The composition of that partnership is expanding to include a broader set of decisionmakers--those who are stakeholders in the outcomes of agricultural science and education. They include providers of funds, providers and users of agricultural science services, and people and institutions impacted by food and agricultural science.

The emerging framework for decisionmaking will mean that decisions about agricultural science must be informed both about the quality of agricultural research, extension, and teaching programs, and about their economic, social, and environmental impacts.

A well-trained and supported group of evaluation researchers will develop in the agricultural science community during the 1980s, along with a growing body of good, objective impact evaluation studies.

Special attention will need to be given to insure that these studies are designed and presented in a form that facilitates their use in the decisionmaking process.



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